

## PATENT ABSTRACTS OF JAPAN

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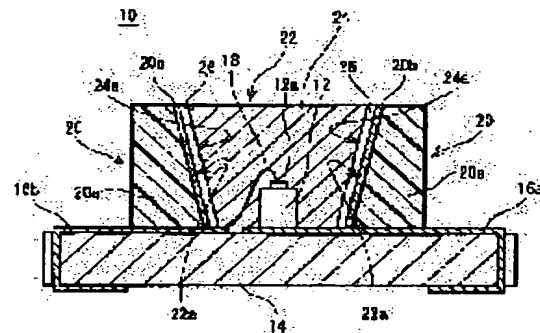
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## (54) LIGHT EMITTING CHIP DEVICE WITH CASE

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a light emitting chip device with a case capable of enhancing its light emitting efficiency.

SOLUTION: The light emitting chip device 10 with the case comprises an LED chip 12 bonded to electrodes 16a, 16b formed on the surface of a board 14. In this case, the case 20 is disposed on the board 14 so that a hole 22 surrounds the chip 12. The hole 22 has an inner peripheral surface 22a of a truncated conical shape radially increased from below toward upward, and a transparent resin 24 for sealing is filled in the surface 22a. When the resin 24 is cured, the resin 24 itself is cured and contracted, and hence an air gap 26 is provided between the surface 22a and the resin 24 (sealer). Accordingly, since the light emitted from the chip 12 is totally reflected on the inner surface 24a of the sealer, the light can be efficiently reflected.



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CLAIMS

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[Claim(s)]

[Claim 1] An electrode carries out bonding of the LED chip to the substrate formed in the front face, and said LED chip on said substrate is surrounded in the case where it has the inner skin of the truncated cone form whose diameter was expanded toward the top from the bottom. In the chip mold luminescence equipment with a case filled up with the resin used as a closure object in said inner skin of said case Chip mold luminescence equipment with a case characterized by carrying out total reflection of the light outputted from said LED chip by forming an opening between said inner skin and said closure objects in respect of said closure inside of the body.

[Claim 2] Chip mold luminescence equipment with a case according to claim 1 which prepares further the sinking-in blocking layer which prevents sinking in to said case of said resin and it was formed on said inner skin.

[Claim 3] Said sinking-in blocking layer is chip mold luminescence equipment with a case according to claim 2 which contains a nickel layer at least.

[Claim 4] Said nickel layer is chip mold luminescence equipment with a case according to claim 3 which is the deposit formed on copper or silicon.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates, for example to the chip mold luminescence equipment with a case which carried out bonding of the LED chip to the substrate with which the electrode was formed in the front face, surrounded the LED chip on a substrate in the case where it has the inner skin of a truncated cone form, and was filled up with the resin which serves as a closure object in that inner skin especially about chip mold luminescence equipment with a case.

[0002]

[Description of the Prior Art] the former -- this -- a seed -- a case -- with -- a chip -- a mold -- luminescence -- equipment -- an example -- Heisei -- 11 -- a year -- eight -- a month -- ten -- a day -- with -- application -- public presentation -- carrying out -- having had -- JP,11-2207178,A -- [ -- H -- 01 -- L -- -- 33 -- / -- 00 -- ] -- an official report -- indicating -- having -- \*\*\*\*. As shown in drawing 4, the LED component 3 is contained in crevice 2a by which this semi-conductor luminescence equipment 1 was formed in the 2nd white substrate 2 including the 2nd white substrate 2. Moreover, die bonding of the LED component 3 is carried out on the 1st white substrate 4. Furthermore, the LED component 3 has the whole surface covered, and the closure is carried out by the light transmission nature synthetic-resin mold section 5 with which crevice 2a was filled up. With this semi-conductor luminescence equipment 1, even if it was the case where light was outputted in the direction of a side face, and the direction of a base contrary to a luminescence side from the LED component 3, luminous efficiency is improved by reflecting light with the 1st white substrate 4 and the 2nd white substrate 4, and making it emanate to a luminescence side.

[0003]

[Problem(s) to be Solved by the Invention] However, with this conventional technique, although light was reflected with the 1st white substrate 4 and the 2nd white substrate 2, since it is not taken into consideration at all about the inside configuration of crevice 2a, reflective effectiveness has not fully been improved. That is, luminous efficiency was not still enough.

[0004] So, the main purpose of this invention is offering the chip mold luminescence equipment with a case which can make luminous efficiency high.

[0005]

[Means for Solving the Problem] This invention carries out bonding of the LED chip to the substrate with which the electrode was formed in the front face. In the chip mold luminescence equipment with a case filled up with the resin which surrounds the LED chip on a substrate in the case where it has the inner skin of the truncated cone form whose diameter was expanded toward the top from the bottom, and serves as a closure object in the inner skin of a case It is chip mold luminescence equipment with a case characterized by carrying out total reflection of the light outputted from an LED chip in respect of the closure inside of the body by forming an opening between inner skin and a closure object.

[0006]

[Function] With this chip mold luminescence equipment with a case, an electrode is formed on

the surface of a substrate, and bonding of the LED chip is carried out to that electrode. Moreover, it fills up with the transparence resin with which the case where it has the inner skin of the truncated cone form whose diameter was expanded towards the top from the bottom surrounds an LED chip, and serves as a closure object at the inner skin. If transparence resin hardens, transparence resin itself will carry out hardening contraction. It is different and an opening is formed between inner skin and transparence resin (closure object). With this chip mold luminescence equipment with a case, since the light outputted from the LED chip carries out total reflection by the inside of a closure object, the light outputted from an LED chip can be reflected efficiently.

[0007] For example, since a sinking-in blocking layer is formed on the inner skin of a case, transparence resin can prevent sinking into a case. For this reason, at the time of hardening contraction of a closure object, a closure object becomes easy to exfoliate from a case, and can form an opening certainly.

[0008] As a sinking-in inhibition agent layer, the nickel layer of thickness (for example, 5-10 micrometers) is used comparatively. By forming a nickel layer thickly, the smoothness of the inner skin of a case becomes high, therefore a closure outside-of-the-body side (inside) can be made smooth, and the reflective effectiveness in a closure inside-of-the-body side can be improved.

[0009] A nickel layer is formed of plating on copper or silicon.

[0010]

[Effect of the Invention] Since the light outputted from an LED chip carries out total reflection by the inside of a closure object according to this invention, it can reflect efficiently. For this reason, luminous efficiency can be made high.

[0011] The above-mentioned purpose of this invention, the other purposes, the description, and an advantage will become still clearer from the detailed explanation of the following examples given with reference to a drawing.

[0012]

[Example] With reference to drawing 1, die bonding of the chip mold luminescence equipment 10 with a case of this example (only henceforth "luminescence equipment") is carried out for the LED chip 12 to electrode (lead) 16a formed in the front face of a substrate 14 for example, with a silver paste including the semi-conductor light emitting device (LED chip) 12. Moreover, wirebonding of the metal thin lines (bonding wire) 18, such as a gold streak for connecting bonding pad 12a and other lead 16b which were prepared in the upper part of the LED chip 12, is carried out. In addition, in order to explain plainly, Leads 16a and 16b are formed in the shape of a thin film in fact, although thickness is given and illustrated. Moreover, patterning of the leads 16a and 16b is carried out to the front face of a substrate 14 by lithography processing and etching processing, and they are formed in it of them. furthermore, Leads 16a and 16b are insulated electrically mutually -- having -- a substrate 14 -- on the other hand -- a principal plane (top face) to a side face -- it is mostly extended and formed to an another side principal plane (rear face) via central [ a part of ] (through hole).

[0013] Moreover, a case 20 is arranged on the top face of a substrate 14 so that luminescence equipment 10 may surround the LED chip 12 including the case 20 which consists of a liquid crystal polymer. that is, the case 20 -- a hole 22 is mostly formed in the center. A case 20 contains the above liquid crystal polymers (opaque resin 20a) and sinking-in blocking layer 20b so that drawing 2 which is an II-II sectional view in drawing 1 may show again. A hole 22 has inner skin 22a of the truncated cone form which serves as path size toward a top from the bottom. Sinking-in blocking layer 20b is formed on this inner skin 22a. This sinking-in blocking layer 20b is a deposit for preventing that the transparence resin 24 mentioned later sinks in to a case 20. Specifically, sinking-in blocking layer 20b contains the nickel (nickel) deposit formed in laminating a copper (Cu) deposit and on the Cu deposit. Moreover, in this example, Cu deposit is about 3 micrometers in thickness, and nickel deposit is 5-10 micrometers in thickness. Thus, in order to form nickel deposit comparatively thickly, smoothness of inner skin 22a of a hole 22 is made high.

[0014] In addition, in this example, although he is trying to form nickel deposit on Cu deposit, the

layer of Si (silicon) may be formed instead of Cu deposit. the layer of this Si -- CVD (Chemical Vapor Deposition) -- it is fabricated by law on the front face of opaque resin 20a.

[0015] It fills up with transparence resin 24 like the epoxy resin used as a closure object in inner skin 22a of the hole 22 formed in such a case 20. Hardening of transparence resin 24 forms a closure object. At this time, transparence resin 24 self carries out hardening contraction, therefore an opening 26 is formed between inner skin 22a and transparence resin 24 (closure object). That is, since sinking-in blocking layer 20b is formed in the inner skin of a case 20, transparence resin 24, i.e., a closure object, exfoliates very easily from inner skin 22a at the time of hardening. Therefore, an opening 26 is formed between the closure object 24 and inner skin 22a.

[0016] In addition, according to an artificer's etc. experiment, an opening 26 is formed by the thickness of 5-10 micrometers. Moreover, when filling up in inner skin 22a, in order to stick transparence resin 24 to inner skin 22a (nickel deposit) with high smoothness, surface (inside) 24a of transparence resin 24, i.e., a closure object, is also made smooth. That is, a reflection factor can be improved.

[0017] Thus, since an opening 26 is formed, as shown in drawing 3, total reflection of the light outputted from the LED chip 12 is carried out by inside 24a of transparence resin 24, i.e., a closure object. It is and that light that is not accumulated and that was outputted from the LED chip 12 in the tilt angle theta of inside 24a of the closure object 24, i.e., inner skin 22a, is determined as the include angle which can carry out total reflection in this example. When are explained using an optical path Q as a tilt angle theta of inside 24a and Normal N is specifically drawn to inside 24a, an include angle to which the acute angle alpha between an optical path Q and Normal N becomes smaller than 40 degrees is determined. In addition, the tilt angle theta may be determined so that "180 degree-theta" may become smaller than 50 degrees.

[0018] The light by which total reflection was carried out is outputted from luminescence equipment 10 almost perpendicularly to the top face of a substrate 14, as optical paths P and Q show. In addition, the light which is not reflected by inside 24a is outputted from luminescence equipment 10 as it is. Moreover, in drawing 3, in order to make it intelligible, hatching of transparence resin 24 is omitted.

[0019] Since total reflection of the light which prepares an opening between the inner skin of a hole and a closure object, and is outputted from an LED chip is carried out by the inside of a closure object according to this example, light can be reflected efficiently. Therefore, luminous efficiency can be made high and brightness can be enlarged.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the illustration Fig. showing one example of this invention.

[Drawing 2] It is the sectional view of the chip mold luminescence equipment with a case shown in the drawing 1 example.

[Drawing 3] It is the sectional view of the chip mold luminescence equipment with a case shown in the drawing 1 example.

[Drawing 4] It is the sectional view showing conventional semi-conductor luminescence equipment.

[Description of Notations]

10 -- Chip Mold Luminescence Equipment with Case

16 -- LED Chip

20 -- Case

20a -- Opaque resin

20b -- Deposit

22 -- Hole

24 -- Transparence Resin (Closure Object)

26 -- Opening

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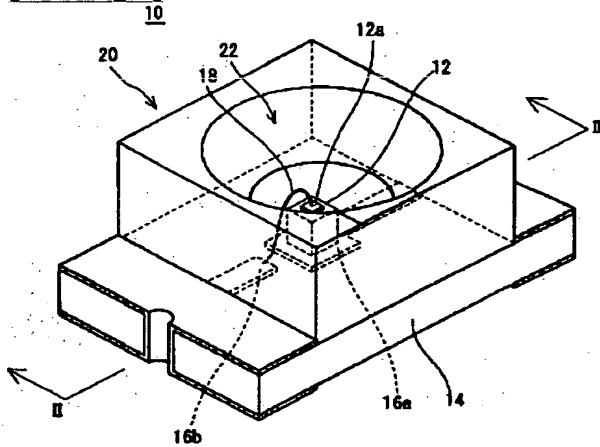
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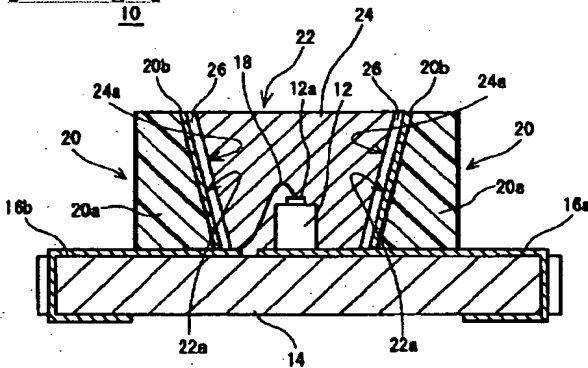
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## DRAWINGS

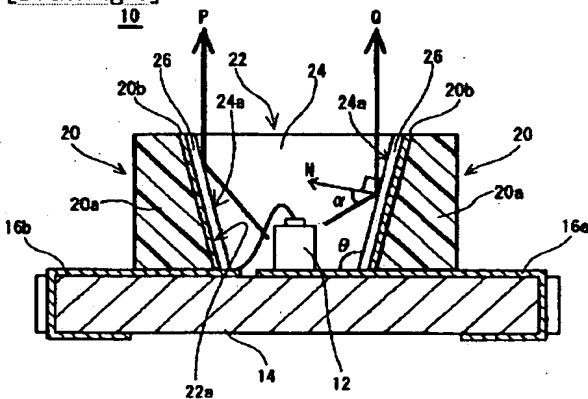
[Drawing 1]



[Drawing 2]

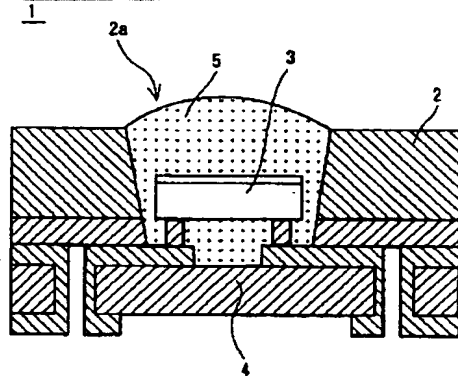


[Drawing 3]





[Drawing 4]



[Translation done.]